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Marked-Up

BOOSTED BRAKING DEVICE WITH EMERGENCY VALVE

The invention relates to a boosted braking device, for a motor vehicle, of the kind which comprise a master cylinder controlling the pressure in at least one brake circuit; a primary piston mounted to slide in the master cylinder to create therein a variation in pressure, this primary piston being subjected to an actuating force made up of an input force exerted by a manual-control member and of a boost force exerted by a booster which is coupled to the manual-control member.

Background of the Invention

The booster may be pneumatic and comprise a rigid casing divided into two pneumatic chambers by a moving partition which may be subjected to a difference in pressure between the chambers under the action of a valve actuated by the manual-control member.

A braking device of this type is known, for example, from EP-B-0 662 894.

The conditions under which braking is exerted may differ. A first instance corresponds to ordinary conditions when an obstacle is seen from a distance and braking is performed relatively gently; this type of braking is known as "normal braking" or "slow braking". Another instance is that of abrupt braking or "emergency braking", for example when an obstacle appears suddenly in front of the driver who has to bring his vehicle to rest as quickly as possible.

With a view to satisfying these various braking conditions, a boosted braking device, of the type defined previously, has been supplemented by an emergency assist valve capable of initiating the intervention of at least two boost ratios corresponding respectively to slow braking and to emergency braking; the boost ratio for slow braking is lower and the hydraulic reaction opposing the advancement of the manual-control member is greater. In the case of emergency braking, the boost ratio is stronger and the hydraulic reaction against the manual-control member is

weaker, which means that the driver can brake for longer and more heavily.

By convention, the term "front" will be used in the remainder of the text to mean a direction directed from the control member toward the master cylinder, and the term "rear" or "back" will be used to denote the opposite direction.

Summary of the Invention

The emergency assist valve comprises a reaction piston which slides in a sealed manner in a bore of the primary piston, the front part of this bore communicating with the interior volume of the master cylinder, a rapid piston of cross section smaller than that of the reaction piston sliding in a sealed manner in a bore of corresponding diameter of the primary piston, and a ratio control actuated by a plunger distributor itself driven by the manual-control member, the assembly being arranged in such a way that under emergency braking, the hydraulic reaction is exerted only on the small cross section of this rapid piston. The slow boost ratio involves the larger-section reaction piston.

A braking device such as this with an emergency assist valve is entirely satisfactory from the operational and braking force point of view. However, embodiments hitherto proposed for the emergency assist valve are relatively bulky with a relatively high number of parts giving rise to a not insignificant cost of manufacture.

It is an object of the invention, above all, to provide a braking device with a more compact emergency assist valve and which has a lower cost of manufacture.

According to the invention, a boosted braking device, for a motor vehicle, of the type defined previously, comprising an emergency assist valve, is characterized in that the reaction piston and the rapid piston form one and the same stepped piston having a part (reaction piston) of large cross section and a part (rapid piston) of small cross section, the large-section part determining, with the corresponding

bore of the primary piston, an annular chamber, the volume of which varies according to the displacement of the stepped piston relative to the primary piston, and that separation/communication means, controlled by the displacement of the stepped piston are designed so that the pressure of the liquid is exerted effectively on the large cross section of the stepped piston when the latter occupies its position of rest or is to the rear of this position, and on only the small cross section when the stepped piston is displaced forward relative to the primary piston under emergency braking.

The large-section part of the stepped piston may lie toward the front and the small-section part toward the rear. The small-section part may have a shoulder against which there bears axially a washer acting as a thrust washer for a compression spring, the other end of which bears against a stop piece anchored in a housing of the primary piston.

The means of separation between the large and small cross section of the stepped piston may be connected to the primary piston. A blind bore is advantageously provided in the stepped piston and open forward, this blind bore communicating, toward its interior end, via at least one hole, with the periphery of the small-section piston, while a sealing means, connected to the primary piston, is provided in the annular chamber, around the small-section piston, to collaborate with the hole(s) in the small-section piston. When the hole(s) is (are) to the rear of the sealing means, the front part of the annular chamber is isolated from the hydraulic pressure of the master cylinder, which means that this pressure acts effectively on the entire area of the large cross section, whereas when the hole(s) is (are) in front of the sealing means, the hydraulic pressure is exerted in the front part of the annular chamber in such a way that this pressure is effective on only the small cross section. The sealing means advantageously consists of a lip seal.

As a preference, the small-section piston is extended toward the plunger distributor by a rod of smaller diameter forming the ratio control. There may be a gap at rest between the rear end of the rod and the plunger distributor.

Apart from the provisions set out hereinabove, the invention consists in a certain number of other provisions which will be dealt with more explicitly hereinafter with regard to an exemplary embodiment described with reference to the appended drawings, but which is not in any way limiting. In these drawings:

Brief Description of the Drawings

Fig. 1 is a part view in section with partial cutaway of a braking device according to the invention;

Fig. 2 is a part view in section, on a larger scale, of elements of Fig. 1 and of the emergency assist valve, the braking device being in the position of rest; and

Fig. 3, finally, shows, in a similar way to Fig. 2, the elements at the onset of rapid braking.

Detailed Description of the Invention

The overall structure and general operation of a boosted braking device of the type of the invention are known, particularly from patents EP-B-0 662 894 or FR-B-2 658 466 and only a brief reminder thereof will be given. For further details, reference may be made to the two aforementioned patents which are incorporated into the description by reference.

Fig. 1 shows a braking device 1 for a motor vehicle, which comprises a master cylinder 2, partially depicted, and a primary piston 3 mounted to slide in the master cylinder 2. A manual-control member 4 comprising a linkage coaxial with the primary piston 3 is designed to exert on this piston an input force from back to front, that is to say from right to left according to the depiction of Fig. 1. The forward displacement of the primary piston 3 creates an increase in pressure of the liquid in the interior volume 5 of the master cylinder, connected to at least one hydraulic brake circuit. The control member 4 is

I claim :-

CLAIMS

1. Boosted braking device, for a motor vehicle, comprising: a master cylinder controlling the pressure in at least one brake circuit; a primary piston mounted to slide in the master cylinder to create therein a variation in pressure, this primary piston being subjected to an actuating force made up of an input force exerted by a manual-control member and of a boost force exerted by a booster which is coupled to the manual-control member; an emergency assist valve comprising a reaction piston which slides in a sealed manner in a bore of the primary piston, the front part of this bore communicating with the interior volume of the master cylinder, a rapid piston of cross section smaller than that of the reaction piston sliding in a sealed manner in a bore of corresponding diameter of the primary piston, and a ratio control actuated by a plunger distributor itself driven by the manual-control member, the assembly being arranged in such a way that under emergency braking, the hydraulic reaction is exerted only on the small cross section of the rapid piston, characterized in that the reaction piston and the rapid piston form one and the same stepped piston having a part of large cross section and a part of small cross section, the large-section part determining, with the corresponding bore of the primary piston, an annular chamber, the volume of which varies according to the displacement of the stepped piston relative to the primary piston, and that separation/communication means, controlled by the displacement of the stepped piston are designed so that the pressure of the liquid is exerted on the large cross section of the stepped piston when the latter occupies its position of rest or is to the rear of this position, and on only the small cross section when the stepped piston is displaced forward

relative to the primary piston under emergency braking.

2. Braking device according to Claim 1, characterized in that the separation/communication means comprise a means of separation between large and small cross section, connected to the primary piston.

3. Braking device according to Claim 1, characterized in that the separation/communication means comprise a blind bore provided in the stepped piston and open forward, this blind bore communicating, toward its interior end, via at least one hole, with the periphery of the small-section piston, while a sealing means, connected to the primary piston, is provided in the annular chamber, around the small-section piston, to collaborate with the hole(s) in the small-section piston.

4. Braking device according to Claim 2, characterized in that the separation/communication means comprise a blind bore provided in the stepped piston and open forward, this blind bore communicating, toward its interior end, via at least one hole, with the periphery of the small-section piston, while a sealing means, connected to the primary piston, is provided in the annular chamber, around the small-section piston, to collaborate with the hole(s) in the small-section piston.

5. Braking device according to Claim 3, characterized in that the sealing means consists of a lip seal of lip.

6. Braking device according to Claim 4, characterized in that the sealing means consists of a lip seal of lip.

7. Braking device according to Claim 1, characterized in that the large-section part of the stepped piston lies toward the front and the small-section part lies toward the rear.

8. Braking device according to Claim 7, characterized in that the small-section part comprises a shoulder against which there may bear axially a washer acting as a thrust washer for a compression spring, the